Bridge No. 18 (Old Hudson Toll Bridge)
Spanning the Kickapoo River,
on Old State Highway No. 131
La Farge Vicinity
Vernon County
Wisconsin

HAER No. WI-65

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
Rocky Mountain Regional Office
National Park Service
U.S. Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

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HISTORIC AMERICAN ENGINEERING RECORD

Bridge No. 18
(Old Hudson Toll Bridge)

HAER No. WI-65

Former Location:	Spanning the St. Croix River on Highway #12 in Hudson St. Croix County, Wisconsin
Present Location:	Spanning the Kickapoo River on Old State Highway #131 La Farge vicinity, Vernon County, Wisconsin UTM: 15.691095.4829360 Quad: La Farge, Wisconsin
Date of Construction:	1912-1913 (Hudson) 1953 (reassembled over Kickapoo River)
Present Owner:	State of Wisconsin
Present Use:	Demolished, October 1986
Significance:	Bridge No. 18 is significant for its Warren truss design features, as well as for its relation to the history of transportation in the St. Croix Valley and the history of Hudson, Wisconsin.
Historians:	Dr. John O. Anfinson and Ms. Jane Lamm Carroll St. Paul District, Corps of Engineers

DESCRIPTION

Bridge No. 18, originally the center span of the Old Hudson Toll Bridge, is an example of a Warren truss bridge, a common bridge design used in the late 19th and early 20th century for railroad and highway bridges across the United States. Bridge No. 18 conforms closely to the general description of a Warren truss design bridge. It has diagonals alternately placed in either tension or compression. The Warren design was easily recognized by its triangular outline. As with Bridge #18, vertical members were often added to strengthen the structure. True Warren trusses are composed of equilateral triangles and have horizontal upper and lower chords. The upper chord on Bridge #18, however, is polygonal, reaching a height of 27 feet in the middle, allowing for a vertical clearance of 14.2 feet. Framed in structural steel, so as to provide a roadway width of 18.3 feet, the bridge is 136 feet long, with a timber decking covered in asphalt.

Overall, few changes were made to the original span when it was rebuilt in 1953. A new guide rail was added, the stringers reinforced with metal plates, and the roller nest replaced with a structural steel plate. Since 1953, no significant changes have been made to the bridge.

THE HUDSON TOLL BRIDGE

Bridge No. 18 laid particular claim to the theme of providing a "unifying structural and visual element within the American landscape." It was the channel span of the nine-span Hudson Toll Bridge over the St. Croix River for 38 years (1912-1951). "Hudson's most famous landmark - the municipally-owned toll bridge (the only one on the border between Minnesota and Wisconsin) was closed to traffic in November 1951. [1] Over the next two years, it was dismantled. In its history at Hudson, the toll bridge took in over three million dollars, a significant sum, considering the tolls were 25 cents per car and 5 cents for each extra passenger.

Acting as consulting engineer for the Central State Bridge Company, which manufactured the Hudson Bridge, was Claude A. P. Turner. He is most known for his invention of flat-slab construction in 1900. However, Turner also gained prominence for his railroad bridge design work. Two bridges of Turner's design, the Mendota Bridge in the Twin Cities and one near Somerset, Wisconsin, have been entered on the National Register of Historic Places.

In the early 20th century, Hudson, Wisconsin, was a busy agricultural, lumbering and commercial center on the St. Croix River. Hoping to facilitate burgeoning highway traffic and to gain better access to the farmers living across the river, Hudson merchants and town boosters began advocating the construction of a bridge from Hudson to Minnesota in the early 1900s. [2] Although many thought a bridge across the wide section of the river that stood between the town and Minnesota was infeasible, in 1910 a bridge booster organization was formed and sold booster buttons to raise money for the project. The bridge booster club persuaded Harold L. North, a Hudson banker, to become actively involved in the project. Since a bridge across the St. Croix involved interstate commerce, a congressional approval was necessary. Congress passed an act in February 1911, granting North and other prominent businessmen in the community the right to build "a wagon and trolley car bridge from a point suitable to the interest of navigation on the east bank of said river between the north line of section 25 of township 29, range 20 west, and the east and west quarter line of said section,... to a point on the west bank of said river almost due west from the place of beginning...." [3]

Immediately after obtaining congressional approval, North and the others organized the St. Croix Bridge Company, elected officers, and collected $5,000 from stockholders to help finance the bridge. The company first contracted with McGrath Construction of Green Bay to build a 2,500-foot dike that would serve as the approach from Hudson to the bridge. Work on the dike began in July 1911 and ended in August 1912. The

steel Warren truss bridge that completed the span was constructed over the next two years and was 18 feet wide and 600 feet long. At the official opening of the Hudson Toll Bridge on June 14, 1914, approximately 2,000 people came to celebrate. The St. Croix Bridge Company operated the toll bridge for four years, at which time the city of Hudson purchased it for $57,461. The city operated the bridge until November 1951, when a free bridge across the river replaced it.

The tolls collected by the municipality were used to develop Hudson's parks and street and kept property taxes in the city relatively low. [4] The original toll charges on the bridge were: 25 cents per auto; 5 cents per passenger; 25 cents for horses and wagon; 10 cents for horse and rider; 50 cents for trucks and 5 cents per pedestrian. By 1942, due to increasingly heavy traffic, tolls had dropped significantly to 15 cents per auto, while horse teams and pedestrians were free. By this time, however, many of the bridge's customers were complaining that they had to pay a toll at all, since bridges elsewhere in the region were free. In addition, the increase in automobile traffic threatened to overburden the bridge. Whereas, in February 1918, only six cars and two trucks passed over the bridge in the entire month, by the 1940s, thousands of vehicles passed over the bridge every day. [5]

In the early 1940s, a proposal by the states of Minnesota and Wisconsin to build a new highway bridge across the St. Croix River raised the ire of Hudson officials and residents, who felt that the city had a right to the toll revenues, since it had built the bridge itself. In addition, Hudson merchants and boosters feared the loss of business, if a new bridge were located too far from the city's hub. A third issue raised at the 1942 congressional hearings on the matter was whether the old toll bridge could accommodate the anticipAted increase in military traffic on Highway No. 12, due to United States involvement in World War II. At the congressional hearing, James Newton, mayor of Hudson, expressed the city's position:

> We feel that since we helped pioneer what is now Highway No. 12 through the city of Hudson, and built a bridge at this point at a time when neither State had the funds nor the inclination for such an enterprise, and at a time when it was a great advantage to the citizens of each State to have such a convenience, that we should be entitled either to keep our investment until such time as individual or corporate-owned bridges are made free, or to have a voice in the type of construction and location of a new structure. [6]

An attempt to amend the new bridge bill to require the two States to compensate Hudson for the loss in toll revenues failed after opponents pointed to figures that showed Hudson had realized an almost twelvefold return on its original investment in the bridge. The city had netted $77,161 per year during the 24 years it operated the bridge. [7]

The bill to build the new free bridge passed over the objections of Hudson. In 1948, construction began on the new bridge, which was built about one mile south of the toll bridge. The new bridge officially opened in November 1951. The Hudson City Council ordered the toll bridge closed and requested bids for dismantling and hauling away the old bridge. Although the steel span was removed, the long dike and the entrance arch to the toll bridge remain today. [8] The main channel span of the steel bridge, in keeping with the promise that Warren truss bridges were versatile and reusable, was reconstructed over the Kickapoo River in a rural area about 1.6 miles north of La Farge, Wisconsin. Thus, it facilitated highway transportation in both rural and urban settings.

WARREN TRUSS BRIDGES

Truss bridges are based on the geometric form of the triangle and provide a rigid structure, using a minimum of material. The design uses many small pieces that join together in a series of triangles. The triangles interconnect with each other and the main members are either stiff, heavy posts or thin, flexible rods. Trusses can be above or under roadways. They resist loads placed by gravity on the structure by each of the parts being put either in tension or compression. Truss bridges were first built in Europe, but became popular in America in the late 18th century. [9]

The first truss bridges were wood, but over the course of the 19th century, trusses of wood and iron were introduced. The first all-metal truss bridges in America were designed by Squire Whipple. In 1847, Whipple published an essay giving the first scientific analysis of a truss. Shortly thereafter, several methods of analyzing trusses developed. [10] The Warren truss, patented in 1848 by British engineers, was quickly adopted by American bridge designers. Its simple design was so successful that it is still used today. A Warren truss has diagonals alternately placed in either tension or compression and is easily recognized by its triangular outline. The Warren truss bridge is one of the two most common designs built in America after 1850. [11] Unlike the bridge trusses of American designers, the "Warren trusses are statistically determinate and hence it is possible to predict with confidence that certain members will always be in tension and that others will always be in compression." [12]

Metal structures and parts were introduced gradually to bridges in America. The major factors leading to the greater use of metal in bridges were: the decreased cost of wrought iron, the greater availability of rolled iron products and the introduction of steel; the scarcity of usable timber and the corresponding increase in its cost; the greater convenience and lower cost of field operations in handling and erecting metal parts; and wooden structures caught fire and decayed more rapidly. After the Civil War, bridge and general construction companies formed to meet the increased demand for iron. Some of these companies operated exclusively as bridge builders and many were formed by patentees to construct a single bridge design. [13]

The expansion of the railroads and the decrease in the cost of iron were the two most significant reasons metal truss bridges multiplied in the second half of the 19th century. [14] As railroad technology improved and locomotives got bigger, wooden truss bridges could no longer carry the heavy loads. The first metal trusses were cast iron and wrought iron; later in the 19th century, they were of steel. Railroad bridges collapsed frequently during the second half of the last century because bridge engineer did not keep pace with advances in railroad technology. Cast iron was too brittle for use with the heavier locomotives, and it often gave way. Although wrought iron was four times as strong as cast iron, it too finally gave way under the ever-increasing loads of the new locomotives. Steel was the answer to the problem, because it had the strength of cast iron and the flexibility of wrought iron. The first all-steel bridge was built over the Mississippi at St. Louis in 1874. [15] By 1890, steel could be manufactured economically enough for use in all sizes of bridges. Bridges could be sized, precut, riveted, drilled, and fitted at the manufacturing site and then reassembled at the bridge site. Between 1880 and 1910, metal bridge companies enjoyed a heyday of success. [16]

The economy, efficiency and strength of metal truss bridges made them popular in both rural and urban communities across America. By 1925, metal truss bridges--the Warren and Pratt types, in particular-- were the most common bridges built in America. As a result, two leading authorities on bridge history assert that the ubiquitous presence of these bridges "provides a unifying element within the American landscape." [17]

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Iron and steel bridges, like those of the Warren truss design, were originally developed to carry the immense weight of steam-powered locomotives. Due to their economy and efficiency, the metal truss configuration of railroad bridges was quickly used in highway construction, enabling the extensive expansion of America's infrastructure. This occurred at a time (1890-1920) when the size and density of America's population was increasing rapidly, and enabled a greater integration of rural and urban areas, both economically and socially.